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Bibliography

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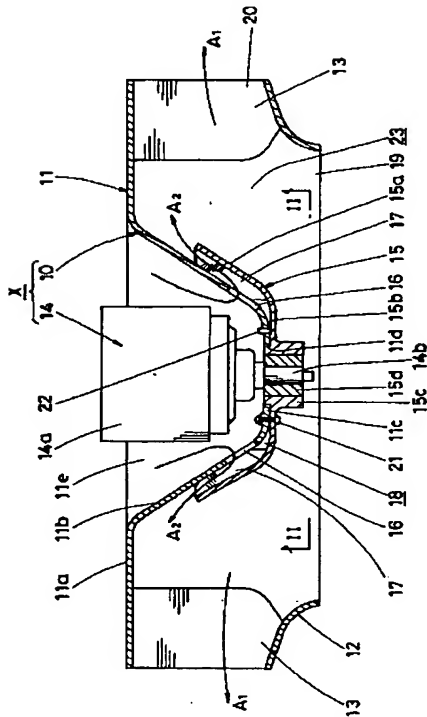
Epitome

(57) [Abstract] (*****)

[Technical problem] Offer of the air conditioner equipped with the centrifugal blower and it which enabled coexistence with the engine performance of a hub on the strength, and the cooling engine performance of a motor.

[Means for Solution] In the centrifugal blower which comes to prepare the at equal intervals and multiple blade 13 for a circumferential direction between the periphery sections of a hub 11 and a shroud 12, While penetrating a hub in the direction of board thickness and forming the cooling ventilating hole 16 in the part corresponding to crevice 11e of a hub The hub cover 15 to which the periphery section carried out opening of the ventilating hole 16 to passage 23 with the airstream way 23 side to the wrap where a gap 18 is secured is attached between crevices at about airstream way 23 flank. The wing 17 which makes the airstream A2 which turns gap circles from a hole 16 side at a periphery section side, and flows with rotation of a hub produce is formed in a gap 18. The flow which passes along a hole 16 according to the intake force of Blower X in this way is promoted, a lot of air presupposes the style of cooling, and is supplied to the motor 14 section, and overheating of a motor is prevented much more certainly.

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CLAIMS

[Claim(s)]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] The invention in this application relates to the air conditioner equipped with the centrifugal blower and this centrifugal blower.

[0002]

[Description of the Prior Art] A centrifugal blower is equipped with the impeller which consists of a shroud by which opposite arrangement is carried out with predetermined spacing to the hub and this hub which are connected with the revolving shaft of a motor, and two or more blades arranged at equal intervals at a circumferencial direction ranging over these both periphery section, and is constituted. In this case, from the need of forming the airstream way which results in the outlet formed from the inlet port formed in the axial center part of this shroud between the above-mentioned hub and a shroud at the periphery section of the above-mentioned hub, generally the axial center part of the above-mentioned hub is conventionally turned to the above-mentioned shroud side, and reentrant formation is carried out. Paying attention to the description on the gestalt of this hub, a motor is arranged in the state of devotion in the crevice of this hub, and miniaturization of the shaft orientations of a centrifugal blower is attained by this.

[0003] However, when the motor has been arranged in the state of devotion in the crevice of a hub in this way, while miniaturization of a centrifugal blower is realized, we are anxious about the cyclicity of the air near [this] the motor being checked, this motor being overheated by the cooling performance degradation of this motor, and the dependability being spoiled. The cooling performance degradation of this motor is remarkable especially in the air conditioner of a configuration of arranging a centrifugal blower in casing of a small tooth space.

[0004] The technique for making the motor part circulate through a cooling wind positively, and preventing overheating of this motor as much as possible in a centrifugal blower, conventionally, in view of this situation, is proposed variously, and there is ***** shown in JP,6-341659,A as the one approach.

[0005] That is, the thing of this well-known example arranges a hub cover, where predetermined spacing is given between hubs, and it guides a part of blow-off air which blows off according to a ventilation operation of the blade of a centrifugal blower near [motor] the above by the above-mentioned hub cover, and it is made to make this cool positively. While forming in the part corresponding to the above-mentioned crevice of the above-mentioned hub two or more through-holes of the cooling style which open those inside and outside for free passage as one of the concrete structures for this A hub cover is arranged so that it may have predetermined spacing and this through-hole part of the cooling style may be covered from the inside (namely, the above-mentioned airstream road side) of the above-mentioned hub to the formation part of the above-mentioned through-hole of the cooling style in the above-mentioned hub. The distribution channel of the cooling style which reaches the above-mentioned airstream way respectively through the gap section of the above-mentioned through-hole of the cooling style and the above-mentioned hub, and a hub cover is constituted near the above-mentioned motor. Intake force of the centrifugal blower which acts on the above-mentioned through-hole part of the cooling style in a part of blow-off air which blows off from the above-

mentioned blade with operation of the above-mentioned centrifugal blower (if it puts in another way) There is a thing it was made to make introduce positively near the above-mentioned motor through the above-mentioned distribution channel of the cooling style the differential pressure before and and the above-mentioned through-hole of the cooling style.

[0006]

[Problem(s) to be Solved by the Invention] However, in the motor cooling structure like ****, since it is the configuration of making circulation of the cooling style performing only using the intake force of the centrifugal blower which acts on the through-hole part of the cooling style formed in the above-mentioned hub, a limitation is in the installation operation of the cooling style naturally. moreover, if it be going to dare raise the installation operation of the cooling style to the bottom of this condition, it be necessary to enlarge opening area of the above-mentioned through-hole of the cooling style formed in the above-mentioned hub but, and when it consider as this configuration, since the reinforcement of the above-mentioned hub fall an increased part of the opening area of this through-hole of the cooling style, a new problem will arise in the point of the dependability of a centrifugal blower.

[0007] Then, the invention in this application is made for the purpose of offering the air conditioner equipped with the centrifugal blower with the high dependability which enabled coexistence with the engine performance of a hub on the strength, and the cooling engine performance of a motor, and this centrifugal blower.

[0008]

[Means for Solving the Problem] In the invention in this application, the following configurations are adopted as a concrete means for solving this technical problem.

[0009] The hub 11 where motor shaft 14b of the motor 14 arranged in this crevice 11e is connected while equipping the axial center section with crevice 11e which carries out a reentrant at the one side of the direction of board thickness in invention of the 1st of this application, The shroud 12 by which blower inlet port 19 was formed in the axial center section while opposite arrangement was carried out with predetermined spacing to this hub 11 and forming the airstream way 23 between these hubs 11, In the centrifugal blower equipped with two or more blades 13 and 13 prepared in the circumferential direction at equal intervals between the periphery sections of the above-mentioned hub 11 and the periphery sections of the above-mentioned shroud 12 which counter mutually, and the impeller 10 which consists of .. While penetrating this hub 11 in the direction of board thickness and forming the through-holes 16 and 16 of the cooling style, and .. in the part corresponding to the above-mentioned crevice 11e of the above-mentioned hub 11 To about above-mentioned airstream way 23 of the above-mentioned crevice 11e in the above-mentioned hub 11 flank Where the predetermined gap section 18 is secured between the above-mentioned crevice 11e, while attaching the above-mentioned through-holes 16 and 16 of the cooling style, and the hub cover 15 to which the periphery section carried out opening of .. to the above-mentioned airstream way 23 with the above-mentioned airstream way 23 side to the wrap It is characterized by preparing the wings 17 and 17 which make the airstream A2 which turns the inside of the above-mentioned gap section 18 to the periphery section side from the above-mentioned through-hole 16 side of the cooling style, and flows with rotation of the above-mentioned hub 11 produce, and .. in the above-mentioned gap section 18.

[0010] In invention of the 2nd of this application, it is characterized by forming the above-mentioned wings 17 and 17 and .. in one with the above-mentioned hub 11 or a hub cover 15 in the centrifugal blower concerning the 1st above-mentioned invention.

[0011] In invention of the 3rd of this application, it is characterized by constituting the above-mentioned centrifugal blower X with a centrifugal blower according to claim 1 or 2 in the ventilation flue 4 formed in casing 1 in the air conditioner which comes to arrange a heat exchanger 6 and a centrifugal blower X.

[0012]

[Effect of the Invention] In the invention in this application, the following effectiveness is acquired by considering as this configuration.

[0013] ** The centrifugal blower concerning invention of the 1st of this application In the centrifugal blower which comes to have the at equal intervals and multiple blades 13 and 13 and .. mutually at a circumferential direction between the periphery sections of BU 11 by which opposite arrangement is carried out, and a shroud 12 While penetrating this hub 11 in the direction of board thickness and forming the through-holes 16 and 16 of the cooling style, and .. in the part corresponding to the above-mentioned crevice 11e of the above-mentioned hub 11 To about above-mentioned airstream way 23 of the above-mentioned crevice 11e in the above-mentioned hub 11 flank Where the predetermined gap section 18 is secured between the above-mentioned crevice 11e, while attaching the above-mentioned through-holes 16 and 16 of the cooling style, and the hub cover 15 to which the periphery section carried out opening of .. to the above-mentioned airstream way 23 with the above-mentioned airstream way 23 side to the wrap In the above-mentioned gap section 18,

the wings 17 and 17 and .. which make the airstream A2 which turns the inside of the above-mentioned gap section 18 to the periphery section side from the above-mentioned through-hole 16 side of the cooling style, and flows with rotation of the above-mentioned hub 11 produce are prepared.

[0014] Therefore, if the airstream A1 which flows toward the blower outlet 20 from blower inlet port 19 produces the inside of the airstream way 23 with operation of a centrifugal blower X The above-mentioned through-holes 16 and 16 of the cooling style and .. which were formed in the above-mentioned hub 11 rather than the above-mentioned blades 13 and 13 and .. The upstream the through-holes 16 and 16 of this cooling style since the airstream way 23 (namely, by the side of intake) is attended and opening is carried out, and .. according to the intake force of acting on a part After being introduced into the above-mentioned gap section 18 through the above-mentioned through-holes 16 and 16 of the cooling style, and .. from the crevice 11e part (the above-mentioned motor 14 near [namely,]) of the above-mentioned hub 11, The airstream A2 which furthermore flows from the periphery section of this gap section 18 to the above-mentioned airstream way 23 side will occur, and the above-mentioned motor 14 will be positively cooled by this airstream A2.

[0015] Furthermore, the above-mentioned wings 17 and 17 and .. are formed between the above-mentioned hub 11 and the above-mentioned hub cover 15 in this case, and the ventilation operation by the above-mentioned wings 17 and 1 and .. works with rotation of the above-mentioned impeller 10. The flow of the above-mentioned airstream A2 by the intake force of a centrifugal blower X is promoted by these wings 17 and 17 and ventilation operation of .., the flow rate of this airstream A2 increases, and so a lot of air is supplied to the motor 14 above-mentioned part as that cooling wind. Overheating of the above-mentioned motor 14 will be prevented much more certainly by this, and the dependability of this motor 14, as a result the dependability of a centrifugal blower X will be raised further.

[0016] Moreover, the flow rate of the above-mentioned wings 17 and 17 and the above-mentioned airstream A2 used as a cooling wind of a motor 14 according to a ventilation operation of .. From being increased from the case where these wings 17 and 17 and .. are not prepared For example, when the flow demand of the above-mentioned airstream A2 is made the same, only the above-mentioned wings 17 and 17 and the flow rate increment by .. can make small the above-mentioned through-holes 16 and 16 of the cooling style, and opening area of .., and the engine performance of the above-mentioned hub 11 on the strength will be raised only for the decrement of this opening area.

[0017] That is, according to the centrifugal blower of this invention, reservation of the engine performance of the above-mentioned hub 11 on the strength and reservation of the dependability of the above-mentioned motor 14 can be reconciled by the very simple and cheap configuration of preparing the above-mentioned wings 17 and 17 and .. in the gap section 18 of the above-mentioned hub 11 and a hub cover 15.

[0018] ** Since the above-mentioned wings 17 and 17 and .. are formed in one with the above-mentioned hub 11 or the hub cover 15 according to the centrifugal blower concerning invention of the 2nd of this application For example, when considering these wings 17 and 17 and .. as the above-mentioned hub 11 or a hub cover 15, and another object configuration, it compares. While there are few components mark and the production process at the time of components manufacture decreases so much, the activity man day is reduced at the time of the assembly of a centrifugal blower X, and a centrifugal blower X can be offered more cheaply as a result.

[0019] ** In the thing which comes to arrange a heat exchanger 6 and a centrifugal blower 10 to the ventilation flue 4 formed in casing 1 according to the air conditioner concerning invention of the 3rd of this application Since the above-mentioned centrifugal blower X is constituted from a centrifugal blower according to claim 1 or 2 In spite of being in the condition that this centrifugal blower X is arranged in casing 1, and the ventilation nature to the above-mentioned motor 14 is checked From a lot of cooling winds being supplied to the above-mentioned motor 14 by the above-mentioned wings 17 and 17 and the ventilation operation of .. which were prepared in the gap section 18 between the above-mentioned hub 11 of the above-mentioned centrifugal blower X, and a hub cover 15, and the overheating being prevented as much as possible A much more reliable air conditioner can be offered.

[0020]

[Embodiment of the Invention] The air conditioner hereafter equipped with the centrifugal blower and this centrifugal blower concerning the invention in this application is concretely explained based on the suitable operation gestalt shown in an accompanying drawing.

[0021] The centrifugal blower X concerning the operation gestalt of the invention in this application is shown in drawing 1 and drawing 2 . The hub 11 where this centrifugal blower X is fixed to revolve by motor shaft 14b of a motor 14, The shroud 12 which formed blower inlet port 19 in the axial center section while opposite arrangement was carried out with predetermined spacing to this hub 11, It has two or more blades 13 and 13 arranged at equal intervals at the circumferencial direction ranging over between the periphery section of the

above-mentioned hub 11, and the periphery sections of the above-mentioned shroud 12, and the impeller 10 which consists of .., and is constituted .. and the above-mentioned impeller 10 makes the path from the above-mentioned blower inlet port 19 to the above-mentioned blower outlet 20 the air stream way 23 while making the periphery section of the above-mentioned hub 11 and the above-mentioned shroud 12 the blower outlet 20.

[0022] Outside flat-surface section 11a prolonged in the direction which the above-mentioned hub 11 comes to carry out cave-in shaping of near the axial center of the disk object of the diameter of predetermined in the direction of board thickness, and is located in the periphery section, and intersects perpendicularly with the axial center of a hub 11, Inside flat-surface section 11c by which 11d of mounting holes of the diameter of predetermined was formed in this axial center location while extending in the direction which is located in the axial center part of this hub 11, and intersects perpendicularly with the axial center, It has inclined plane section 11b of the shape of a conical surface which continues the inner circumference [of the above-mentioned outside flat-surface section 11a], and periphery side of the above-mentioned inside flat-surface section 11c. Therefore, the above-mentioned hub 11 is made into the gestalt which carries out a reentrant to the above-mentioned inclined plane section 11b to the above-mentioned airstream way 23 side in an inside flat-surface section 11c part, a part for this reentrant is set to crevice 11e, and the above-mentioned motor 14 is arranged in the state of devotion in this crevice 11e.

[0023] Moreover, two or more (this operation gestalt five pieces) through-holes 16 of the cooling style of the shape of a slot which makes the above-mentioned crevice 11e and the above-mentioned airstream way 23 open for free passage are formed in the above-mentioned inside flat-surface section 11c approach location of the above-mentioned inclined plane section 11b in the above-mentioned hub 11. And the hub cover 15 of the following ** is attached in above-mentioned inside flat-surface section 11c of the above-mentioned hub 11 so that these through-holes 16 and 16 of the cooling style and .. may be covered from the above-mentioned airstream way 23 side.

[0024] The above-mentioned hub cover 15 is really [resin] which has a dished gestalt so that the configuration of the part applied to the above-mentioned inside flat-surface section 11c from the bottom half section of the above-mentioned inclined plane section 11b of the above-mentioned hub 11 may be met a formation article. It is located in the periphery side and comes to have flat-surface section 15b corresponding to inside flat-surface section 11c of the above-mentioned hub 11, and boss section 15c which follows the inner circumference side of this flat-surface section 15b succeeding the lower limit section of inclined plane section 15a corresponding to inclined plane section 11b of the above-mentioned hub 11, and this inclined plane section 15a. In addition, above-mentioned boss section 15c is equipped with metal insertion 15d, and motor shaft 14b of the above-mentioned motor 14 is connected with the above-mentioned hub cover 15 and the above-mentioned hub 11 through this insertion 15d.

[0025] Furthermore, the wings 17 and 17 of the shape of a rib prolonged in the direction of a path in the inside (namely, inside by the side of a reentrant) of the above-mentioned inclined plane section 15a of the above-mentioned hub cover 15 and .. are formed in the circumferencial direction in one with this hub cover 15 by regular intervals. The formation location in the height dimension and circumferencial direction of this wing 17 While it sets in the condition of having made this hub cover 15 attaching from the inside to inside flat-surface section 11c of the above-mentioned hub 11 and the top face of this wing 17 sticks or approaches the front face of inclined plane section 11b of the above-mentioned hub 11 It is set up so that these each wings 17 and 17 and .. may correspond to each above-mentioned through-holes 16 and 16 of the cooling style by the side of the above-mentioned hub 11, and the mid-position of .., respectively. In addition, positioning of a circumferencial direction and the direction of a path is made by making the locator pin 22 which protruded on this insert in the above-mentioned hub 11 side, and the above-mentioned hub cover 15 is being fixed to the above-mentioned hub 11 side by each fixed screws 21 and 21 and ..

[0026] Like the above, in the condition of having carried out and having attached the above-mentioned hub cover 15 in the above-mentioned hub 11 side, in that periphery section, the conic gap section 18 which carries out an opening free passage is formed in the above-mentioned airstream way 23 with the gap dimension which is equivalent to the height dimension of the above-mentioned wing 17 between this hub 11 and a hub cover 15, this gap section 18 is faced each above-mentioned through-holes 16 and 16 of the cooling style, and .., and opening is carried out. Therefore, crevice 11e of the outside of the above-mentioned hub 11 will be open for free passage on the above-mentioned airstream way 23 through each above-mentioned through-holes 16 and 16 of the cooling style, .., the above-mentioned gap section 18.

[0027] Thus, in the constituted centrifugal blower X, if the above-mentioned motor 14 is operated and the above-mentioned impeller 10 rotates, the air inhaled in the above-mentioned airstream way 23 from the above-mentioned blower inlet port 19 will blow off from the above-mentioned blower outlet 20 as blow-off air according to each above-mentioned blades 13 and 13 and a ventilation operation of .. (airstream A1 reference).

[0028] each above-mentioned through-holes 16 and 16 of the cooling style which face the above-mentioned airstream way 23 of the upstream ratio than the above-mentioned blades 13 and 13 and .. with the ventilation operation based on the original function of this centrifugal blower X, and carry out opening, and .. the intake force accompanying ventilation is acting on a part. Therefore, the air by the side of the above-mentioned crevice 11e is inhaled by the internal and external differential pressure of the above-mentioned through-hole 16 of the cooling style through the above-mentioned through-hole 16 of the cooling style at the above-mentioned gap section 18 side, and the airstream A2 which goes to the above-mentioned airstream way 23 from above-mentioned crevice 11e through the above-mentioned through-hole 16 of the cooling style occurs by it between the above-mentioned crevice 11e, the above-mentioned gap section 18, and the above-mentioned airstream way 23. The body of motor 14a part of the above-mentioned motor 14 arranged in the above-mentioned crevice 11e is cooled by this airstream A2, and that overheating is prevented.

[0029] Furthermore, in the thing of this operation gestalt, applied the invention in this application and each above-mentioned wings 17 and 17 and .. are prepared in the above-mentioned gap section 18. These each wings 17 and 17 and .. also demonstrate a ventilation operation with rotation of the above-mentioned impeller 10, and according to the ventilation operation by each of these wings 17 and 17 and .. The flow of the above-mentioned airstream A2 produced according to the intake force based on the internal and external differential pressure of the above-mentioned through-hole 16 of the cooling style will be promoted, and the flow rate of this airstream A2 will increase. It leads to increase of the air content introduced by making the style of cooling increase of the flow rate of this airstream A2 as it is at the body of motor 14a part of the above-mentioned motor 14. Consequently, the cooling engine performance to the above-mentioned motor 14 as compared with the case where it is structure conventionally in which the above-mentioned wings 17 and 17 and .. are not prepared, it is markedly alike, and improves, overheating of the above-mentioned motor 14 is prevented much more certainly, and the dependability on actuation of the above-mentioned motor 14, as a result the dependability of the above-mentioned centrifugal blower X are raised.

[0030] On the other hand, that the above-mentioned wings 17 and 17 and the airflow of the cooling style supplied to the above-mentioned motor 14 side by preparing .. increase, and the higher cooling engine performance is obtained as mentioned above. For example, are [then] the same as the former in need cooling airflow required for cooling of the above-mentioned motor 14 (when it is the structure where the above-mentioned wing 17 is not formed). I hear that the above-mentioned through-holes 16 and 16 of the cooling style and opening area of .. can be made small by the airflow increase by the above-mentioned wings 17 and 17 and .., and it is, and reduction of the opening area of this through-hole 16 of the cooling style leads to improvement in the engine performance of the above-mentioned hub 11 on the strength as it is.

[0031] Therefore, in the centrifugal blower X of this operation gestalt, it can reconcile in coincidence raising the cooling engine performance of the above-mentioned motor 14, and aiming at improvement in that dependability according to the very easy and cheap structure of preparing the above-mentioned wings 17 and 17 and .. in the above-mentioned gap section 18, and raising the engine performance of the above-mentioned hub 11 on the strength, and aiming at improvement in the dependability on that reinforcement.

[0032] In addition, in this operation gestalt, although the above-mentioned wing 17 is formed in one with the above-mentioned hub cover 15, in other operation gestalten of this application, the above-mentioned wing 17 can also be formed in one with the above-mentioned hub 11. Moreover, in this operation gestalt, although the above-mentioned wing 17 is formed in the shape of a direct rib, in other operation gestalten, this wing 17 can also be formed in curve tabular like the above-mentioned blade 13.

[0033] On the other hand, the interior unit Z of the separate mold air conditioner equipped with the centrifugal blower X of a configuration like **** is shown in drawing 3. This interior unit Z is an interior unit of the head-lining embedding type by which laying-under-the-ground arrangement is carried out from an interior-of-a-room side at head lining 24, and a heat exchanger 6 is arranged around this centrifugal blower X, and it is constituted while it arranges the above-mentioned centrifugal blower X in the center section of the ventilation flue 4 in casing 1. In addition, while a sign 2 is inlet port corresponding to the blower inlet port 19 of the above-mentioned centrifugal blower X and a bell mouth 9 is arranged in this drawing at this inlet port 2, the lower part side of this bell mouth 9 is equipped with the intake grill 7 equipped with the filter 8. Moreover, the downstream of the above-mentioned heat exchanger 6 is attended, and the outlet 3 is formed in the periphery side of the above-mentioned intake grill 7.

[0034] In the above-mentioned interior unit Z, by operation of the above-mentioned centrifugal blower X, the indoor air inhaled from the above-mentioned inlet port 2 is turned to the above-mentioned heat exchanger 6 side from the blower outlet 20 of this centrifugal blower X, and it blows off. And while passing the above-mentioned heat exchanger 6, heat exchange of this blow-off air is carried out to the refrigerant which

circulates through this heat exchanger 6 side, and it blows off from the above-mentioned outlet 3 indoors as warm air or cold blast, and it performs heating or air conditioning of this interior room (airstream A1 reference).

[0035] On the other hand, a part of blow-off air which blew off from the blower outlet 20 of the above-mentioned centrifugal blower X While being introduced in crevice 11e of the above-mentioned hub 11 in which the above-mentioned motor 14 was held through the gap of the top face (namely, top face of the above-mentioned hub 11) of the impeller 10 of the above-mentioned centrifugal blower X, and top-plate 1a of the above-mentioned casing 1 The air introduced into this crevice 11e according to the synergistic effect with the above-mentioned wings 17 and 17 and the ventilation operation of .. which were prepared in the gap section 18 between the intake force by the side of the above-mentioned airstream way 23 accompanying rotation of the above-mentioned impeller 10, the above-mentioned hub 11, and a hub cover 15 It flows in the above-mentioned gap section 18 through the through-hole 16 of the cooling style of the above-mentioned hub 11, and blows off from this gap section 18 in the upper part of the above-mentioned airstream way 23 further (airstream A2 reference). Although the above-mentioned motor 14 is the configuration arranged to the bad part of ventilation nature, that body of motor 14a is efficiently cooled by this airstream A2, and overheating of the above-mentioned motor 14 is certainly prevented, as a result the high dependability of the above-mentioned interior unit Z is secured. That is, like this interior unit Z, remarkable effectiveness is especially expectable because the above-mentioned motor 14 applies the centrifugal blower X like the above with the high cooling engine performance of this motor 14 in the thing of a configuration of being arranged in the bad location of the ventilation nature in casing 1.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the centrifugal blower concerning the invention in this application.

[Drawing 2] It is the II-II important section view Fig. of drawing 1 .

[Drawing 3] It is the sectional view of the air conditioner concerning the invention in this application.

[Description of Notations]

In casing and 2, inlet port and 3 a ventilation flue and 6 for an outlet and 4 A heat exchanger, [1] In 7, an intake grill and 8 a bell mouth and 10 for a filter and 9 An impeller, In a hub and 12, a shroud and 13 a motor and 15 for a blade and 14 A hub cover, [11] 16 -- the through-hole of the cooling style, and 17 -- a wing and 18 -- the gap section and 19 -- blower inlet port and 20 -- for a gage pin and 23, an airstream way, and A1 and A2 are [a blower outlet and 21 / a fixed screw and 22 / a centrifugal blower and Z of airstream and X] interior units (air conditioner).

[Translation done.]

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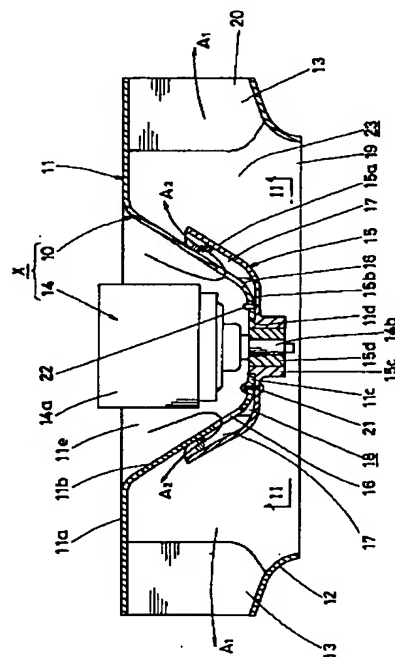
弁理士 大浜 博

(54) 【発明の名称】 遠心送風機及び該遠心送風機を備えた空気調和機

(57) 【要約】 (修正有)

【課題】 ハブの強度性能とモータの冷却性能との両立を可能とした遠心送風機及びそれを備えた空気調和機の提供。

【解決手段】 ハブ11とシュラウド12の外周部間に円周方向に等間隔で複数のブレード13を備えてなる遠心送風機において、ハブの凹部11eに対応する部位にハブをその板厚方向に貫通して冷却通風孔16を形成する一方、空気流路23側部位に、凹部との間に間隙18を確保した状態で通風孔16を空気流路23側から覆うと共にその外周部が流路23に開口したハブカバー15を取り付け、間隙18内にハブの回転に伴い間隙部内を孔16側から外周部側に向け流れる空気流A₂を生ぜしめる羽根17を設ける。かくして送風機Xの吸込力により孔16を通る流れが助長され、多量の空気がモータ14部に冷却風として供給され、モータの過熱がより一層確実に防止される。



【特許請求の範囲】

【請求項1】 軸心部に板厚方向の一方側に凹入する凹部(11e)を備えるとともに該凹部(11e)内に配置されたモータ(14)のモータ軸(14b)が連結されるハブ(11)と、

該ハブ(11)に対して所定間隔をもって対向配置され該ハブ(11)との間に空気流路(23)を形成するとともにその軸心部には送風機吸込口(19)が設けられたシュラウド(12)と、

相互に対向する上記ハブ(11)の外周部と上記シュラウド(12)の外周部との間に円周方向に等間隔で設けられた複数のブレード(13)、(13)、・・・とからなる羽根車(10)を備えた遠心送風機であって、上記ハブ(11)の上記凹部(11e)に対応する部位に該ハブ(11)をその板厚方向に貫通して通気開口(16)、(16)、・・・を形成する一方、

上記ハブ(11)における上記凹部(11e)の上記空気流路(23)側部位に、上記凹部(11e)との間に所定の間隙部(18)を確保した状態で上記冷却風通孔(16)、(16)、・・・を上記空気流路(23)側から覆うとともにその外周部が上記空気流路(23)に開口したハブカバー(15)を取り付けるとともに、上記間隙部(18)内には、上記ハブ(11)の回転に伴って上記間隙部(18)内を上記冷却風通孔(16)側からその外周部側に向けて流れる空気流(A₂)を生ぜしめる羽根(17)、(17)、・・・を設けたことを特徴とする遠心送風機。

【請求項2】 請求項1において、上記羽根(17)、(17)、・・・が、上記ハブ(11)又はハブカバー(15)と一体的に形成されていることを特徴とする遠心送風機。

【請求項3】 ケーシング(1)内に形成された通風路(4)に、熱交換器(6)と遠心送風機(X)とを配置してなる空気調和機であって、上記遠心送風機(X)が請求項1又は2に記載の遠心送風機であることを特徴とする空気調和機。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本願発明は、遠心送風機及び該遠心送風機を備えた空気調和機に関するものである。

【0002】

【従来の技術】遠心送風機は、モータの回転軸に連結されるハブと該ハブに対して所定間隔をもって対向配置されるシュラウドとこれら両者の外周部に跨がって且つ円周方向に等間隔で配置される複数のブレードとからなる羽根車を備えて構成される。この場合、上記ハブとシュラウドとの間に、該シュラウドの軸心部分に形成される吸込口から上記ハブの外周部に形成される吹出口に至る空気流路を形成する必要から、従来一般に、上記ハブの軸心部分を上記シュラウド側に向けて凹入形成してい

る。かかるハブの形態上の特徴に着目し、このハブの凹部内にモータを没入状態で配置し、これによって遠心送風機の軸方向のコンパクト化を図っている。

【0003】ところが、このようにモータをハブの凹部内に没入状態で配置した場合には、遠心送風機のコンパクト化が実現される反面、該モータ近傍への空気の循環性が阻害され、該モータの冷却性能の低下により該モータが過熱しその信頼性が損なわれることが懸念され、かかるモータの冷却性能の低下は、遠心送風機を小スペースのケーシング内に配置する構成の空気調和機において特に顕著である。

【0004】かかる事情に鑑み、従来より、遠心送風機において、そのモータ部分に冷却風を積極的に循環させて該モータの過熱を可及的に防止するための技術が種々提案されており、その一つの方法として、例えば特開平6-341659号公報に示される如きものがある。

【0005】即ち、この公知例のものは、ハブとの間に所定の間隔を持たせた状態でハブカバーを配置し、遠心送風機のブレードの送風作用により吹き出される吹出空気の一部を上記ハブカバーにより上記モータ近傍に誘導してこれを積極的に冷却させるようにしたものである。このための具体的構造の一つとして、上記ハブの上記凹部に対応する部位にその内外を連通する冷却風通孔を複数個形成するとともに、上記ハブにおける上記冷却風通孔の形成部位に、該冷却風通孔部分を上記ハブの内側(即ち、上記空気流路側)から所定の間隔をもって覆うようにハブカバーを配置して、上記モータの近傍から上記冷却風通孔及び上記ハブとハブカバーとの間隙部をそれぞれ介して上記空気流路に至る冷却風流通経路を構成し、上記遠心送風機の運転に伴い上記ブレードから吹き出される吹出空気の一部を、上記冷却風通孔部分に作用する遠心送風機の吸込力(換言すれば、上記冷却風通孔の前後の圧力差)により上記冷却風流通経路を介して上記モータの近傍に積極的に導入させるようにしたものがある。

【0006】

【発明が解決しようとする課題】ところが、上述の如きモータ冷却構造においては、上記ハブに形成した冷却風通孔部分に作用する遠心送風機の吸込力のみを利用して冷却風の循環を行わせる構成であることから、冷却風導入作用に自ずと限界がある。また、かかる条件下において敢えて冷却風導入作用を高めようとするれば、上記ハブに形成される上記冷却風通孔の開口面積を大きくする必要があるが、かかる構成とした場合には、該冷却風通孔の開口面積の増大分だけ上記ハブの強度が低下することから、遠心送風機の信頼性という点において新たな問題が生じることになる。

【0007】そこで本願発明は、ハブの強度性能とモータの冷却性能との両立を可能とした信頼性の高い遠心送風機、及び該遠心送風機を備えた空気調和機を提供する

ことを目的となされたものである。

【0008】

【課題を解決するための手段】本願発明ではかかる課題を解決するための具体的手段として次のような構成を採用している。

【0009】本願の第1の発明では、軸心部に板厚方向の一方側に凹入する凹部11eを備えるとともに該凹部11e内に配置されたモータ14のモータ軸14bが連結されるハブ11と、該ハブ11に対して所定間隔をもって対向配置され該ハブ11との間に空気流路23を形成するとともにその軸心部には送風機吸込口19が設けられたシュラウド12と、相互に対向する上記ハブ11の外周部と上記シュラウド12の外周部との間に円周方向に等間隔で設けられた複数のブレード13、13、・・・とからなる羽根車10を備えた遠心送風機において、上記ハブ11の上記凹部11eに対応する部位に該ハブ11をその板厚方向に貫通して冷却風通孔16、16、・・・を形成する一方、上記ハブ11における上記凹部11eの上記空気流路23側部位に、上記凹部11eとの間に所定の間隙部18を確保した状態で上記冷却風通孔16、16、・・・を上記空気流路23側から覆うとともにその外周部が上記空気流路23に開口したハブカバー15を取り付けるとともに、上記間隙部18内には、上記ハブ11の回転に伴って上記間隙部18内を上記冷却風通孔16側からその外周部側に向けて流れる空気流 A_2 を生ぜしめる羽根17、17、・・・を設けたことを特徴としている。

【0010】本願の第2の発明では、上記第1の発明にかかる遠心送風機において、上記羽根17、17、・・・を、上記ハブ11又はハブカバー15と一体的に形成したことを特徴としている。

【0011】本願の第3の発明では、ケーシング1内に形成された通風路4に、熱交換器6と遠心送風機Xとを配置してなる空調機において、上記遠心送風機Xを請求項1又は2に記載の遠心送風機で構成したことを特徴としている。

【0012】

【発明の効果】本願発明ではかかる構成とすることにより次のような効果が得られる。

【0013】① 本願の第1の発明にかかる遠心送風機は、相互に対向配置されるハブ11とシュラウド12の外周部間に円周方向に等間隔で複数のブレード13、13、・・・を備えてなる遠心送風機において、上記ハブ11の上記凹部11eに対応する部位に該ハブ11をその板厚方向に貫通して冷却風通孔16、16、・・・を形成する一方、上記ハブ11における上記凹部11eの上記空気流路23側部位に、上記凹部11eとの間に所定の間隙部18を確保した状態で上記冷却風通孔16、16、・・・を上記空気流路23側から覆うとともにその外周部が上記空気流路23に開口したハブカバー15を取

り付けるとともに、上記間隙部18内には、上記ハブ11の回転に伴って上記間隙部18内を上記冷却風通孔16側からその外周部側に向けて流れる空気流 A_2 を生ぜしめる羽根17、17、・・・を設けている。

【0014】従って、遠心送風機Xの運転に伴いその空気流路23内を送風機吸込口19から送風機吹出口20に向かって流れる空気流 A_1 が生じると、上記ハブ11に形成された上記冷却風通孔16、16、・・・が上記ブレード13、13、・・・よりも上流側（即ち、吸込側）の空気流路23に臨んで開口していることから、該冷却風通孔16、16、・・・部分に作用する吸込力によって、上記ハブ11の凹部11e部分（即ち、上記モータ14の近傍）から上記冷却風通孔16、16、・・・を通過して上記間隙部18に導入された後、さらに該間隙部18の外周部から上記空気流路23側に流れる空気流 A_2 が発生し、この空気流 A_2 によって上記モータ14が積極的に冷却されることになる。

【0015】さらに、この場合、上記ハブ11と上記ハブカバー15との間に上記羽根17、17、・・・が形成されており、上記羽根車10の回転に伴って上記羽根17、17、・・・による送風作用が働く。この羽根17、17、・・・の送風作用により、遠心送風機Xの吸込力による上記空気流 A_2 の流れが助長され、該空気流 A_2 の流量が増加し、それだけ多量の空気が上記モータ14部分にその冷却風として供給される。これにより、上記モータ14の過熱がより一層確実に防止され、該モータ14の信頼性、延いては遠心送風機Xの信頼性がより一層高められることになる。

【0016】また、上記羽根17、17、・・・の送風作用によりモータ14の冷却風として利用される上記空気流 A_2 の流量が、該羽根17、17、・・・を設けていない場合よりも増加されることから、例えば、上記空気流 A_2 の必要流量を同じとした場合には上記羽根17、17、・・・による流量増加分だけ上記冷却風通孔16、16、・・・の開口面積を小さくすることができ、該開口面積の減少分だけ上記ハブ11の強度性能が高められることになる。

【0017】即ち、この発明の遠心送風機によれば、上記ハブ11とハブカバー15との間隙部18に上記羽根17、17、・・・を設けるという極めて簡易且つ安価な構成により、上記ハブ11の強度性能の確保と上記モータ14の信頼性の確保とを両立させることができるものである。

【0018】② 本願の第2の発明にかかる遠心送風機によれば、上記羽根17、17、・・・を、上記ハブ11又はハブカバー15と一体的に形成しているもので、例えばこの羽根17、17、・・・を上記ハブ11又はハブカバー15と別体構成とする場合に比して、部品点数が少なく、それだけ部品製造時における製造工程が減少するとともに遠心送風機Xの組み立て時においてはその作業

工数が低減され、結果的に遠心送風機Xをより安価に提供することができるものである。

【0019】③ 本願の第3の発明にかかる空気調和機によれば、ケーシング1内に形成された通風路4に、熱交換器6と遠心送風機10とを配置してなるものにおいて、上記遠心送風機Xを請求項1又は2に記載の遠心送風機で構成しているの、該遠心送風機Xがケーシング1内に配置され、上記モータ14への通風性が阻害される状態であるにも拘わらず、上記遠心送風機Xの上記ハブ11とハブカバー15との間の間隙部18に設けた上記羽根17、17、・・・の送風作用により上記モータ14へより多量の冷却風が供給されその過熱が可及的に防止されることから、より一層信頼性の高い空気調和機を提供することができるものである。

【0020】

【発明の実施の形態】以下、本願発明にかかる遠心送風機及び該遠心送風機を備えた空気調和機を添付図面に示す好適な実施形態に基づいて具体的に説明する。

【0021】図1及び図2には、本願発明の実施形態にかかる遠心送風機Xを示している。この遠心送風機Xは、モータ14のモータ軸14bに軸着されるハブ11と、該ハブ11に対して所定間隔をもって対向配置されるとともにその軸心部に送風機吸込口19を形成したシュラウド12と、上記ハブ11の外周部と上記シュラウド12の外周部との間に跨がって且つ円周方向に等間隔で配置された複数のブレード13、13、・・・とからなる羽根車10を備えて構成される。そして、上記羽根車10は、上記ハブ11及び上記シュラウド12の外周部を送風機吹出口20とするとともに、上記送風機吸込口19から上記送風機吹出口20に至る通路を空気流路23としている。

【0022】上記ハブ11は、所定径の円板体の軸心近傍を板厚方向に陥没成形してなるものであって、その外周部に位置し且つハブ11の軸心に直交する方向に延びる外側平面部11aと、該ハブ11の軸心部分に位置し且つその軸心に直交する方向に延びるとともに該軸心位置には所定径の取付孔11dが形成された内側平面部11cと、上記外側平面部11aの内周側と上記内側平面部11cの外周側とを連続する円錐面状の傾斜面部11bとを備えている。従って、上記ハブ11は、上記傾斜面部11bと内側平面部11c部分において上記空気流路23側へ凹入する形態とされ、この凹入部分を凹部11eとし、この凹部11e内に上記モータ14が没入状態で配置される。

【0023】また、上記ハブ11における上記傾斜面部11bの上記内側平面部11c寄り位置には、上記凹部11eと上記空気流路23とを連通せしめる長穴状の冷却風通孔16が複数個（この実施形態では5個）形成されている。そして、上記ハブ11の上記内側平面部11cには、この冷却風通孔16、16、・・・を上記空気流

路23側から覆う如く次述のハブカバー15が取り付けられている。

【0024】上記ハブカバー15は、上記ハブ11の上記傾斜面部11bの下半部から上記内側平面部11cにかけての部分の形状に沿う如く皿状形態をもつ樹脂一体形成品であって、その外周側に位置して上記ハブ11の傾斜面部11bに対応する傾斜面部15aと、該傾斜面部15aの下端部に連続して上記ハブ11の内側平面部11cに対応する平面部15bと、該平面部15bの内周側に連続するボス部15cとを備えてなる。尚、上記ボス部15cには、金属製のインサート15dが装着されており、上記モータ14のモータ軸14bは、このインサート15dを介して上記ハブカバー15及び上記ハブ11に連結されている。

【0025】さらに、上記ハブカバー15の上記傾斜面部15aの内面（即ち、凹入側の内面）には、その径方向に延びるリブ状の羽根17、17、・・・が、円周方向に等間隔で該ハブカバー15と一体的に形成されている。この羽根17の高さ寸法及び円周方向における形成位置は、該ハブカバー15を上記ハブ11の内側平面部11cに対してその内側から衝合させた状態において、該羽根17の上面が上記ハブ11の傾斜面部11bの表面に密着あるいは近接するとともに、該各羽根17、17、・・・がそれぞれ上記ハブ11側の上記各冷却風通孔16、16、・・・の中間位置に対応するように設定されている。尚、上記ハブカバー15は、これに突設された位置決めピン22を上記ハブ11側に嵌入させることで円周方向及び径方向の位置決めがなされ、且つ各固定ネジ21、21、・・・によって上記ハブ11側に固定されている。

【0026】上記の如くして上記ハブカバー15を上記ハブ11側に取り付け付けた状態においては、該ハブ11とハブカバー15との間に、上記羽根17の高さ寸法に相当する間隙寸法をもち且つその外周部において上記空気流路23に開口連通する円錐状の間隙部18が形成されており、上記各冷却風通孔16、16、・・・はこの間隙部18に臨んで開口している。従って、上記ハブ11の外側の凹部11eは、上記各冷却風通孔16、16、・・・及び上記間隙部18を介して上記空気流路23に連通することになる。

【0027】このように構成された遠心送風機Xにおいては、上記モータ14が運転され上記羽根車10が回転すると、上記各ブレード13、13、・・・の送風作用により、上記送風機吸込口19から上記空気流路23内に吸い込まれた空気は、上記送風機吹出口20から吹出空気として吹き出される（空気流A₁参照）。

【0028】この遠心送風機Xの本来の機能に基づく送風作用に伴って、上記ブレード13、13、・・・よりも上流側の上記空気流路23に臨んで開口する上記各冷却風通孔16、16、・・・部分には、送風に伴う吸込力が

作用している。従って、上記冷却風通孔16の内外の圧力差によって、上記凹部11e側の空気が上記冷却風通孔16を通して上記間隙部18側に吸い込まれ、上記凹部11eと上記間隙部18及び上記空気流路23の間には、上記冷却風通孔16を介して上記凹部11eから上記空気流路23に向かう空気流 A_2 が発生する。この空気流 A_2 によって、上記凹部11e内に配置されている上記モータ14のモータ本体14a部分が冷却され、その過熱が防止されるものである。

【0029】さらに、この実施形態のものにおいては、本願発明を適用して、上記間隙部18内に上記各羽根17、17、・・・を設けており、上記羽根車10の回転に伴って該各羽根17、17、・・・も送風作用を発揮し、この各羽根17、17、・・・による送風作用により、上記冷却風通孔16の内外の圧力差に基づく吸込力により生じる上記空気流 A_2 の流れが助長され、該空気流 A_2 の流量が増大することになる。この空気流 A_2 の流量の増大は、そのまま上記モータ14のモータ本体14a部分に冷却風として導入される空気量の増大につながり、この結果、上記モータ14に対する冷却性能は、上記羽根17、17、・・・が設けられていない従来構造の場合に比して格段に向上し、上記モータ14の過熱がより一層確実に防止され、上記モータ14の作動上の信頼性、延いては上記遠心送風機Xの信頼性が高められるものである。

【0030】一方、上述のように、上記羽根17、17、・・・を設けることで上記モータ14側に供給される冷却風の風量が増大しより高い冷却性能が得られるということは、例えば上記モータ14の冷却に必要な必要冷却風量を従来（上記羽根17が設けられていない構造の場合）と同じとすれば、上記羽根17、17、・・・による風量増大分だけ上記冷却風通孔16、16、・・・の開口面積を小さくすることができるということであり、またこの冷却風通孔16の開口面積の減少は、そのまま上記ハブ11の強度性能の向上につながるものである。

【0031】従って、この実施形態の遠心送風機Xにおいては、上記間隙部18内に上記羽根17、17、・・・を設けるという極めて簡単且つ安価な構造により、上記モータ14の冷却性能を高めてその信頼性の向上を図ることと、上記ハブ11の強度性能を高めてその強度上の信頼性の向上を図ることを同時に両立させることができるものである。

【0032】尚、この実施形態においては、上記羽根17を上記ハブカバー15と一体的に形成しているが、本願の他の実施形態においては上記羽根17を上記ハブ11と一体的に形成することもできるものである。また、この実施形態においては、上記羽根17を直リブ状に形成しているが、他の実施形態においては、該羽根17を上記ブレード13と同様に湾曲板状に形成することもできるものである。

【0033】一方、図3には、上述の如き構成の遠心送風機Xを備えたセパレート型空調機の室内機Zを示している。この室内機Zは、天井24に室内側から埋設配置される天井埋め込みタイプの室内機であって、ケーシング1内の通風路4の中央部に上記遠心送風機Xを配置するとともに、該遠心送風機Xの周囲に熱交換器6を配置して構成されている。尚、同図において符号2は上記遠心送風機Xの送風機吸込口19に対応する吸込口であって、該吸込口2にはベルマウス9が配置されるとともに、該ベルマウス9の下方側にはフィルター8を備えた吸込グリル7が装着されている。また、上記吸込グリル7の外周側には、上記熱交換器6の下流側に臨んで吹出口3が形成されている。

【0034】上記室内機Zにおいては、上記遠心送風機Xの運転により、上記吸込口2から吸い込んだ室内空気を該遠心送風機Xの送風機吹出口20から上記熱交換器6側に向けて吹き出す。そして、この吹出空気は、上記熱交換器6を通過する間に該熱交換器6側を循環する冷媒と熱交換して温風あるいは冷風として上記吹出口3から室内に吹き出され、該室内の暖房あるいは冷房を行う（空気流 A_1 参照）。

【0035】一方、上記遠心送風機Xの送風機吹出口20から吹き出された吹出空気の一部は、上記遠心送風機Xの羽根車10の上面（即ち、上記ハブ11の上面）と上記ケーシング1の天板1aとの間隙を通して上記モータ14が収容された上記ハブ11の凹部11e内に導入されるとともに、該凹部11eに導入された空気は、上記羽根車10の回転に伴う上記空気流路23側の吸込力と上記ハブ11とハブカバー15との間の間隙部18に設けた上記羽根17、17、・・・の送風作用との相乗効果によって、上記ハブ11の冷却風通孔16を通して上記間隙部18内に流れ、さらに該間隙部18から上記空気流路23の上部に吹き出される（空気流 A_2 参照）。この空気流 A_2 によって、上記モータ14が通風性の悪い部位に配置された構成であるにも拘わらず、そのモータ本体14aが効率よく冷却され、上記モータ14の過熱が確実に防止され、延いては上記室内機Zの高い信頼性が確保されるものである。即ち、この室内機Zの如く上記モータ14がケーシング1内の通風性の悪い位置に配置される構成のものにおいては、該モータ14の冷却性能が高い上記の如き遠心送風機Xを適用することで特に顕著な効果が期待できるものである。

【図面の簡単な説明】

【図1】本願発明にかかる遠心送風機の断面図である。

【図2】図1のII-II要部矢視図である。

【図3】本願発明にかかる空調機の断面図である。

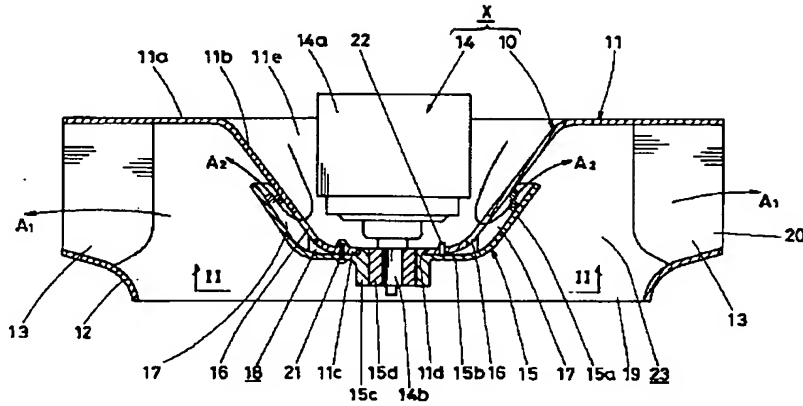
【符号の説明】

1はケーシング、2は吸込口、3は吹出口、4は通風路、6は熱交換器、7は吸込グリル、8はフィルター、9はベルマウス、10は羽根車、11はハブ、12はシ

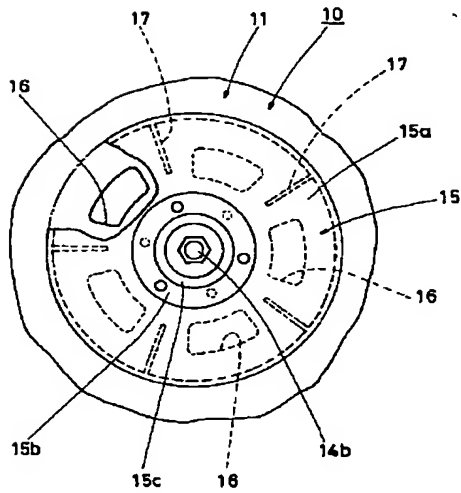
クラウド、13はブレード、14はモータ、15はハブ
カバー、16は冷却風通孔、17は羽根、18は間隙
部、19は送風機吸込口、20は送風機吹出口、21は

固定ネジ、22は位置決めピン、23は空気流路、 A_1 及び A_2 は空気流、Xは遠心送風機、Zは室内機（空調機）である。

【図1】



【図2】



【図3】

